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Influence of physicochemical properties of oil on high presure air injection efficiency

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Abstract

The effect of crude oil characteristics upon the HPAI technology application is developed in the paper. It is found out that contrary to established opinion the crude oil molecular weight and density does not determine the self-ignition characteristics in situ. The results of air injection pilot project show that oil density determines the intensity of mass transfer processes between injected air (gas) and crude oil (liquid). It was established that oil intense degassing happens behind the displacement front when gas containing nitrogen is injected. During the pilot project for the first time it was observed hydrocarbon components C2-C4 segregation. This process happened due to the formation of second liquid Carbone dioxide phase on the boundary between oil and gas. The observed phenomenon is fundamentally new for gas and WAG EOR method's application (for hydrocarbon and non-hydrocarbon gas injection). Thus the pilot project results admit one to determine the necessary condition of water after gas injection start for WAG process with fuel gases. The conditions is the following: maximum variation of light hydrocarbon components C1-C5 accompanied with maximum of C2-C4 output in associated gas recovery means the most favorable time for water injection start. The field data materials clearly show that oil density and fractional composition are the most valuable characteristics for air injection projects application. They mostly effect not on the oil reactivity due to oxidation but on the opportunity of oil de-gassing in reservoir conditions.

Keywords

Air injection, Enhanced oil recovery (EOR), High pressure air injection (HPAI), In-situ combustion, Pilot project